18. *Strategic International Collaborations and Comparison Activities*

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Objective: To assess and document international comparability for chemical measurements among the world's national chemical metrology laboratories and to link such comparability to the U.S. and North American systems of chemical measurement traceability for improved accuracy in chemical measurements.

Problem: The need for demonstrating comparability and traceability of chemical analysis data is becoming recognized worldwide. Chemical measurements play a key role in the diagnosis and treatment of diseases, identification of global trends in the state of the biosphere, and the evaluation of the effects of various contaminants in the environment are only possible on the basis of reliable data. A significant proportion of industrial production and international trade is also dependent on chemical measurements. The uncertainty in the validity and/or lack of recognition of many of these measurements leads to a considerable amount of repeated measurements, particularly by regulatory agencies on imported products. This is expensive and impedes the free flow of international trade.

Approach: In October of 1999, nations and economies signed a "Mutual Recognition Arrangement between National Metrology Institutes for recognition of National Measurement Standards and of Calibrations, and Measurement Certificates. The Analytical Chemistry Division is a key participant in efforts of the International Committee for Weights and Measures (CIPM) and its Consultative Committee on Amount of Substance (CCQM) to address the issues of comparability and traceability for chemical measurements. The CCQM has begun to assess chemical measurement comparability through strategically selected intercomparisons among national chemical metrology laboratories in the general areas of advanced materials, biotechnology, commodities, the environment, food, forensics, health, pharmaceuticals, and general analytical applications. The Division has participated in all 15 of the intercomparisons that have been undertaken to date. The Division is also using the assessment exercises conducted through the CCQM for selecting partners for strategic bi- or trilateral collaborations to determine and document the comparability of NIST primary methods and standards with those of other nations and/or metrological regions. The Division holds the Chair for the Chemical Metrology Working Group within the Interamerican System of Metrology (SIM) and past chair for the NORAMET subregion.

Results and Future Plans: The CCQM has formed five working groups: (1) gas analysis, (2) organic analysis, and (3) inorganic analysis, (3) pH and Conductivity, and (4) Key Comparisons. These working groups are responsible for selecting and overseeing the operation of key comparisons that address chemical measurement-related issues important for international trade, environmental, health, and safety-related decision making. The Division is very active and has led various activities within all five working groups.

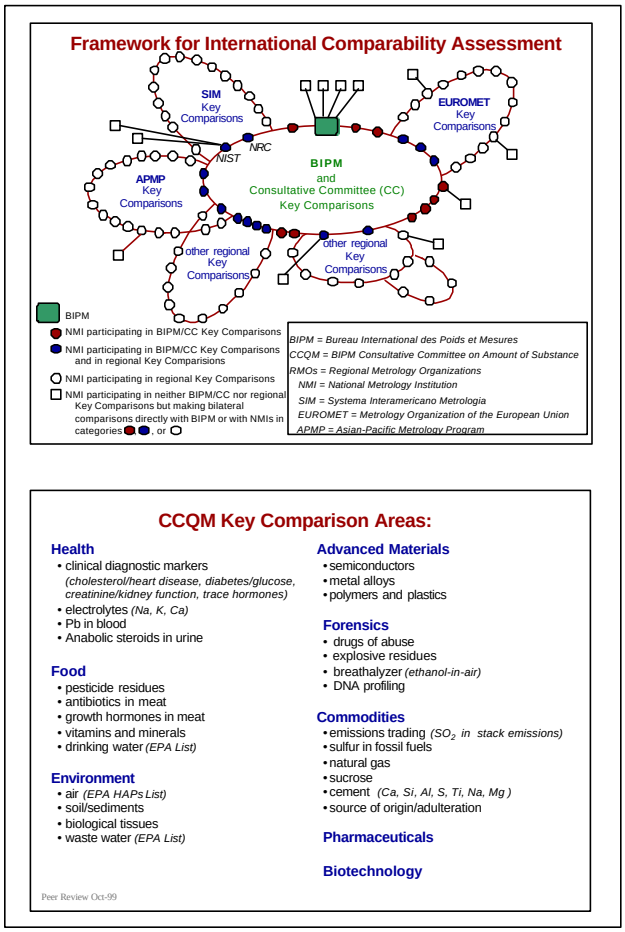
The Division provides the official leadership for the chemical metrology activities within SIM. Because the capabilities of the 34 countries within SIM span such a broad range, activities have initially been focused on training and capability assessment. Since only 3 of the 34 countries have formal programs in chemical metrology, we conducted the following courses during the past year for current or designated future leaders of chemical metrology programs within SIM:

Organic Analytical Metrology; December, 1998; 12 participants
Spectrochemical Metrology; December, 1998; 14 participants
Nuclear Analytical Metrology; April, 1999; 6 participants
Classical Methods; May, 1999; 13 participants
Gas Metrology; June, 1999;10 participants

We also identified six intercomparison exercises to test the proficiency of NMI's or their designated collaborators for addressing chemical measurement problems within the Americas.

- *SIM-QM-P1:* Chlorinated Pesticides in Organic Solvent.
- *SIM-QM-P2:* Trace Metals in Drinking Water
- *SIM-QM-P3*: Automotive Exhaust Emission Gases
- *SIM-QM-P4:* pH (5-7 range)

- *SIM-QM-P5:* Vitamins and Minerals in Infant Formula
- *SIM-6:* Holmium oxide



The NORAMET subregion of SIM consists of NIST, NRC-Canada, and CENAM-Mexico. All three institutes produce Certified Reference Materials (CRMs) and have agreed to extract intercomparison data while assisting in each other's reference materials certification campaigns. The following intercomparisons took place during the past year using this paradigm:

- Metals in Drinking Water [CENAM]
- Elements in Sediments and Mussel Tissue [NRC]
- Organics in Sediments and Fish Tissue [NIST]
- Methyl Hg in Fish Tissue [NIST]
- Vitamins and Minerals in Milk Powder [CENAM]

For six years we have been involved in a strategic bilateral program with the National Measurement Institute (NMi) of The Netherlands for determining the equivalence of primary gas standards. Our activities have resulted in a formal "Declaration of Equivalence" that is mutually recognized by the U.S. EPA and European environmental regulatory bodies as documenting the equivalence of eight NIST and NMi primary gas mixtures suites (spanning a wide range of concentrations). In previous years the carbon dioxide, carbon monoxide, ethanol, oxygen, propane, nitric oxide, and sulfur dioxide PSMs have been shown to be equivalent. During the past year we have worked to establish equivalence in natural gas standards and have continued efforts to address a bias of 2% observed between NIST and NMi primary standards for hydrogen sulfide. Additional collaborations for assessing the equivalence of primary standards have been established with DFM (Denmark) and OHM (Hungary) for conductivity, with the PTB for pH, with EMPA (Switzerland) for elemental solution standards, with NIMC for volatile organic compound standards, with INPL (Israel) for moisture in oils, and with NPL (UK) for optical absorbance filter standards.